4-3 Trigonometric Functions on the Unit Circle

The given point lies on the terminal side of an angle θ in standard position. Find the values of the six trigonometric functions of θ.

3. (−4, −3)

ANSWER:

$$\sin\theta = -\frac{3}{5}, \cos\theta = -\frac{4}{5}, \tan\theta = \frac{3}{4},$$
$$\csc\theta = -\frac{5}{3}, \sec\theta = -\frac{5}{4}, \cot\theta = \frac{4}{3}$$

6. (5, −3)

ANSWER:

$$\sin\theta = -\frac{3\sqrt{34}}{34}, \cos\theta = \frac{5\sqrt{34}}{34}, \tan\theta = -\frac{3}{5},$$
$$\csc\theta = -\frac{\sqrt{34}}{3}, \sec\theta = \frac{\sqrt{34}}{5}, \cot\theta = -\frac{5}{3}$$

Find the exact value of each trigonometric function, if defined. If not defined, write *undefined*.

9. $\sin \frac{\pi}{2}$

ANSWER:

1

12. csc 270°

ANSWER:

−1

15. tan π

ANSWER:

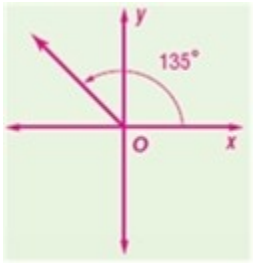
0

Sketch each angle. Then find its reference angle.

18. 135°

ANSWER:

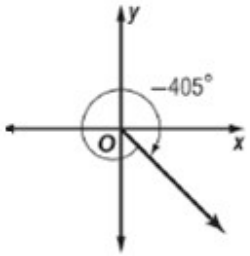
45°



21. −405°

ANSWER:

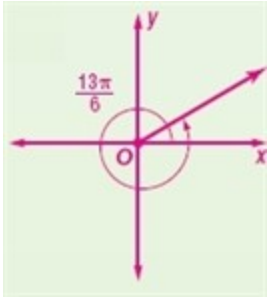
45°



24. $\frac{13\pi}{6}$

ANSWER:

$\frac{\pi}{6}$



Find the exact value of each expression.

27. $\sin \frac{3\pi}{4}$

ANSWER:

$\frac{\sqrt{2}}{2}$

30. sec (−150°)

ANSWER:

$-\frac{2\sqrt{3}}{3}$

4-3 Trigonometric Functions on the Unit Circle

Find the exact values of the five remaining trigonometric functions of θ.

33. $\tan\theta = 2$, where $\sin\theta > 0$ and $\cos\theta > 0$

ANSWER:

$\sin\theta = \frac{2\sqrt{5}}{5}, \cos\theta = \frac{\sqrt{5}}{5}, \csc\theta = \frac{\sqrt{5}}{2},$

$\sec\theta = \sqrt{5}, \cot\theta = \frac{1}{2}$

36. $\cos\theta = -\frac{12}{13}$, where $\sin\theta < 0$

ANSWER:

$\sin\theta = -\frac{5}{13}, \tan\theta = \frac{5}{12}, \csc\theta = -\frac{13}{5},$

$\sec\theta = -\frac{13}{12}, \cot\theta = \frac{12}{5}$

39. $\tan\theta = -1$, where $\sin\theta < 0$

ANSWER:

$\sin\theta = -\frac{\sqrt{2}}{2}, \cos\theta = \frac{\sqrt{2}}{2}, \csc\theta = -\sqrt{2},$

$\sec\theta = \sqrt{2}, \cot\theta = -1$

Find the exact value of each expression. If undefined, write *undefined*.

45. $\cos\frac{11\pi}{3}$

ANSWER:

$\frac{1}{2}$

48. $\cot 510°$

ANSWER:

$-\sqrt{3}$

51. $\cot\left(-\frac{5\pi}{6}\right)$

ANSWER:

$\sqrt{3}$

54. $\sec\frac{7\pi}{6}$

ANSWER:

$-\frac{2\sqrt{3}}{3}$

57. $\tan\frac{14\pi}{3}$

ANSWER:

$-\sqrt{3}$

Complete each trigonometric expression.

60. $\cos 60° = \sin$ ___

ANSWER:

30° or 150°

63. $\cos\frac{7\pi}{6} = \sin$ ___

ANSWER:

$\frac{4\pi}{3}$ or $\frac{5\pi}{3}$